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Distribution and variation in number of Malabar Pied Hornbills *Anthracoceros coronatus* (Boddaert) in selected areas of North Kanara forest of western ghats in Karnataka (India)*

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Abstract. Survey was conducted in selected forest areas of North Kanara district in Western Ghats of Karnataka from December 1983 to December 1984. The Malabar Pied Hornbills *Anthracoceros coronatus* were counted from all the selected forest areas such as Haliyal, Dandeli, Kulagi, Ambikanagar and Ganeshgudi (Supa). Maximum number of 74, and a single biggest flock of 58 hornbills were recorded at Dandeli study area in the month of March 1984. The highest average number of hornbills in Dandeli area was 21.69 followed by Ambikanagar (1.38) and Ganeshgudi (1.0). The lowest number was found in Haliyal (0.30) and Kulagi (0.30). Food plants of hornbills of the same study area were surveyed and recorded their number. Noted the highest number (82) of food plants at Dandeli, followed by Ganeshgudi (62), Ambikanagar (43), Kulagi (41) and Haliyal (39). Fruiting of most of the food plants was found in summer months. Fruiting in *Ficus* spp. is found throughout the year and that of *Strychnos nux-vomica* spread out from November to April. Variation in the number of hornbills from one area to another is dependent on the number of food plants in the area and on their fruiting season. The number of hornbills in different areas was also found dependent on their suitable habitat.

Introduction

Hornbills are known for the unique characteristic casque on their massive beak and for their highly evolved nesting habits. Recent records by Kemp and Crowe (1985) revealed the distribution of 48 species of hornbills in Ethiopian and Oriental Region. Malabar Pied Hornbill *Anthracoceros coronatus* is found in the Indian sub-continent (Ali and Ripley, 1983).

As early as in 1898, Davidson reported the distribution and number of *A. coronatus* in Malnaad particularly in North Kanara district in the East of Haliyal, Yellapur, Mundgod, Bhutkal and Kutgui. Overall distribution of this species along the south western coast from Ratnagiri south through western Karnataka to Kerala shows that it is discontinuous. After Davidson (1898) there are no reports regarding these hornbills except Koelz (1942) who surveyed only the northern part of north kanara particularly, Supa, Londa and Castle Rock. Malabar pied hornbills *A. coronatus* are forest-living birds, found only in heavy jungles and feed mainly on fruits (Jerdon, 1862; Baker, 1927; Ali and Ripley, (1983). Tikadar (1983) enlisted the hornbill *A. coronatus* under threatened species. It was further stated by him that once this bird was in good number, but during the twentieth century, due to rapid destruction of forests and the natural habitats, resulted in the depletion in population. However, he did not mention exact number of *A. coronatus*. Poonswad *et al* (1983) warned that the continuation of the destruction of the habitats of hornbills would eventually result in the extinction of several species. The number is dwindling due to local persecution for its reputed medicinal value (Ripley, 1982). Due to deforestation and local

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persecution for the alleged medicianal values of its meat and particularly the use of the latter two as charm by tribal people also resulted in the depletion of the population of the hornbills (Tikadar, 1983).

General survey of North Kanara forest areas revealed the occurrence of variety of birds. Sighting the hornbills in Dandeli and Ramanaguli, in fact aroused an interest to study the hornbills. Viewing the threatened status of these birds, survey in the selected forest areas of North Kanara district in Western Ghats to study the occurrence, distribution and seasonal variation in the number of *A. coronatus* is envisaged. The selected study areas for the survey were as detailed below.

Study Areas

The study areas (Fig. 1) were Haliyal, Dandeli, Kulagi, Ambikanagar and Ganeshgudi (Supa) forests of North Kanara (Uttara Kannada) district in Western Ghats of Karnataka. The above mentioned study areas are situated in between the latitude 14° 45′ and 15° 25′ North and longitude 74° 25′ and 74° 50′ East. According to Davidson (1898), the study areas are included in the above Ghat portion of the district. The elevation ranges from 300 to 600 m above Mean Sea Level. The study areas Haliyal, Dandeli, Kulagi, Ambikanagar and Ganeshgudi commanded 11598.5, 11556 1, 9430.2 and 20525.7 hectares respectively.

Figure 1

1 Haliyal
2 Dandeli
3 Kulagi
4 Ambikanagar
5 Ganeshgudi
6 Ramanaguli

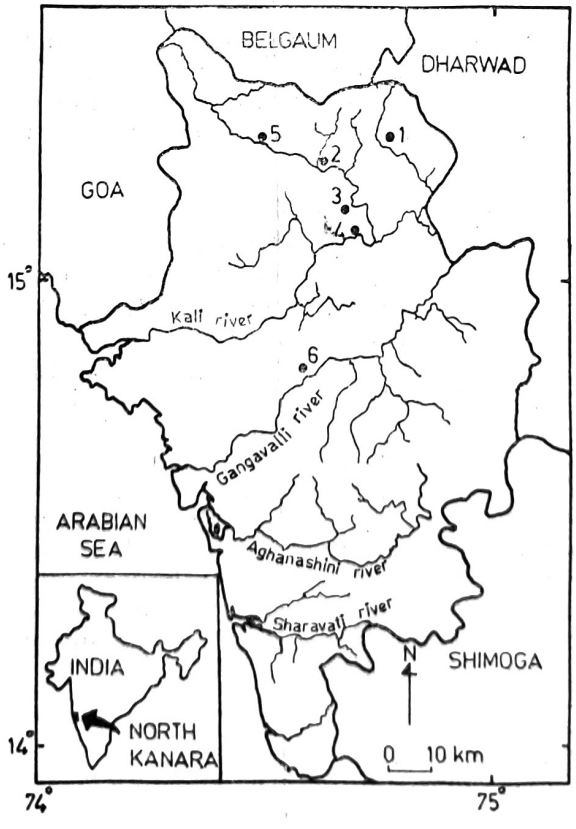

Fig. 1. Study areas for the survey of Malabar Pied Hornbill *Anthracocerus coronatus* in North Kanara district of Western Ghats.

Kali, Gangavalli, Aghanashini and Sharavati rivers are flowing in the district. Kali river flows in the northern part of the district. Gangavalli, Aghanashini and Sharavati flow towards south. All these rivers join the Arabian Sea. Climatic conditions, present position of the forests and the general flora and fauna of the district are briefly described.

Climate : Three seasons are distinct with their respective climatic conditions.

i) The monsoon season lasts from June to September with heavy rains. The area receives south-west monsoon rains. The peak period of rains is June, July and August. At times, heavy rains may continue in October and they are very sparse up to November and other months. The total annual rainfall during the years 1984 and 1985 was 1571.1 mm and 1268.2 mm respectively. ii) The winter season falls between October and January. Very often in the morning hours heavy haze is of common occurrence. iii) Summer season comprising February to May is found dry and hot. The annual atmospheric temperature varied from 6.7°C to 39.8°C. The mean minimum temperature during 1983 to 1986 in January 1986 was 10.6°C and the mean maximum temperature in March 1985 and 1986 was 36.9°C.

In summer months the ground vegetation was found completely dried. Shedding of leaves starts from February in the deciduous forest. The incidence of forest fire causing heavy damage to the forest is of common occurrence. The smoke of the industries in the atmosphere particularly in Dandeli was always prevalent.

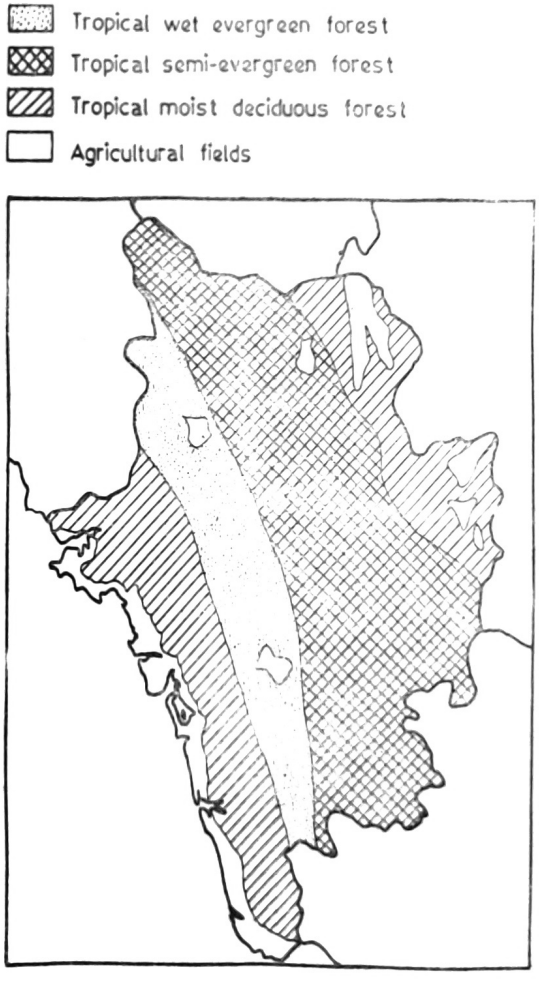

Fig. 2 Types of forests in North Kanara district as in Forest Atlas of India, published by the Director, National Atlas Organisation, Calcutta (1976).

Flora: Diversified flora is the peculiarity of the study area. According to the official report from Uttara Kannada Gazetteer (Kamath, 1986), the forest area of North Kanara district is 8292.65 Sq. km. out of the total geographical area of 10291 sq. km. with a percentage of 80.57. Few decades ago, the area was covered by a continuous stretch of profusely rich tropical evergreen forest (Fig. 2). Presently several biotic and abiotic factors have drastically reduced and degraded these forests. The evergreen forests are gradually turning to deciduous forests. The increasing population has a direct bearing on increased demand for agricultural lands and this has always in adverse effect on valuable forests. Now, the natural, evergreen, virgin forest in the entire Western Ghats of North Kanara district can be seen only at Anshi (Plate 1a) which is declared as National Park from November, 1987.

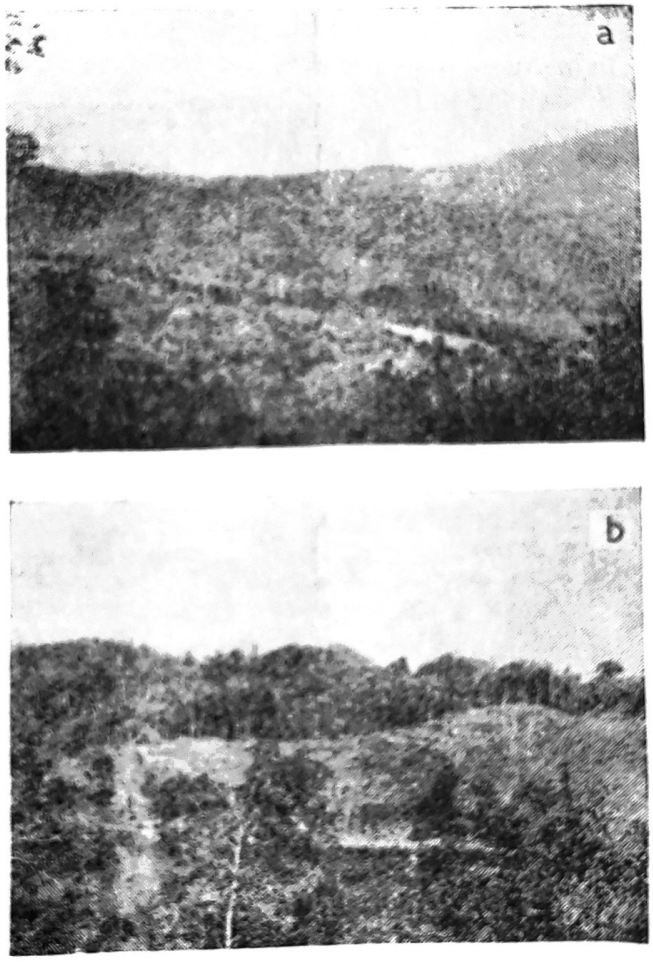

Plate 1. a. Tropical wet evergreen forest at Anshi, North Kanara district. b. Clearing the forest for the construction of hydro-electric at Moulinga village near Dandeli.

In recent years, the study areas in the North Kanara forest are under heavy destruction. Clear felling of the forest trees has taken place indiscriminately particularly in Haliyal, Supa, Joida talukas for the establishment of hydro-electric projects (Plate 1b). The establishment of the Kali Project Stage-I construction of dams, excavation of tunnels. drawing high tension power lines (Plate 2a), construction of townships (Plate 2b), power houses, roads, quarries have variously destroyed the vast areas of forest. According to Saldanha (1986), the threat to the plant cover of the district is from the proposals to develop the hydel potential of the rivers. Kali Project Stage-II will utilise the release of water from Supa and Nagjhari Power Houses by the construction of three dams with Power Houses at their toes at Dandeli, Kodsalli and Kadra. The Gangavalli Stage-I and II as well as the Sharavati Tail Race Dam are on the Drawing

boards. These, as well as the contemplated dams on the Aghanshini can result in a loss of over 40,000 hectares of forest land in the district.

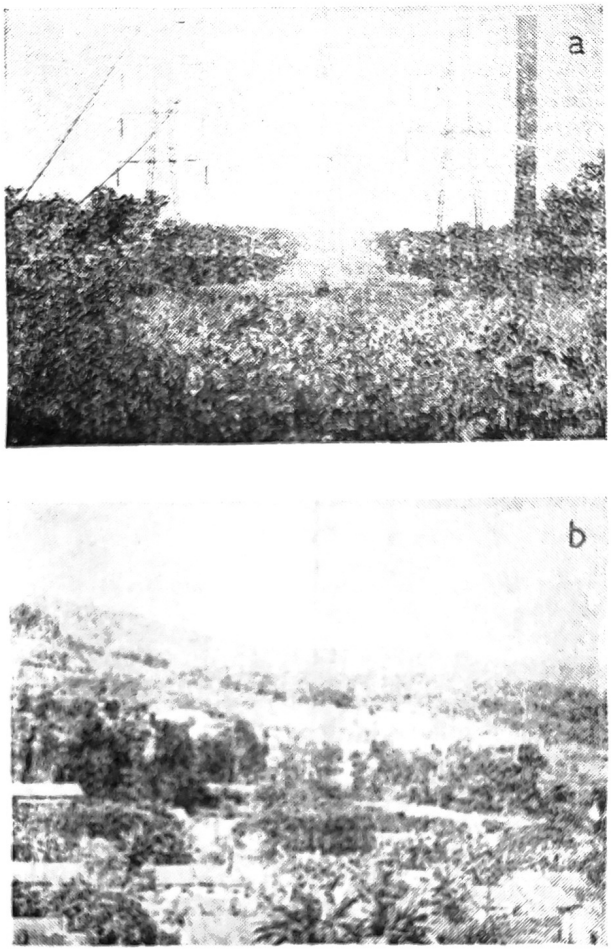

Plate 2. a. Deforested for drawing high tension electric lines. Now, utilising the area for teak nursery. b. Deforested for the construction of staff colonies near the Supa dam site at Ganeshgudi (Supa).

The industries in North Kanara are forest-based. Hence, the most of the forest areas have been degraded for feeding the required wood and timber for the Paper Mills and Plywood Factories. Some of the degraded areas have been converted into quick growing plantations particularly *Casuarina equisetifolia, Acacia auriculiformes, Eucalyptus* spp. to meet the continuous demand of Paper Mills. Mining (Plate 3a) is another added ravage for the forest and its degradation. The encroachment for agricultural purposes (Plate 3b) and rehabilitation (Plate 4a) have posed a serious problem in the maintenance of forests.

The North Kanara forest is considered as one of the principal sources of timber. The timber has been extracted by a selective felling thus degrading evergreen forests. To meet the increased demand, some areas have been clear felled and planted with monoculture of teak (Plate 4b), *Eucalyptus* and other species. Clearing of high forest has lead to the destruction of habitat of wildlife. The wildlife which was once abundantly available can hardly be seen now.

The study areas comprising Haliyal, Dandeli, Kulagi, Ambikanagar and Ganeshgudi (Supa) for the present observations are having the timber trees. Hardly few patches

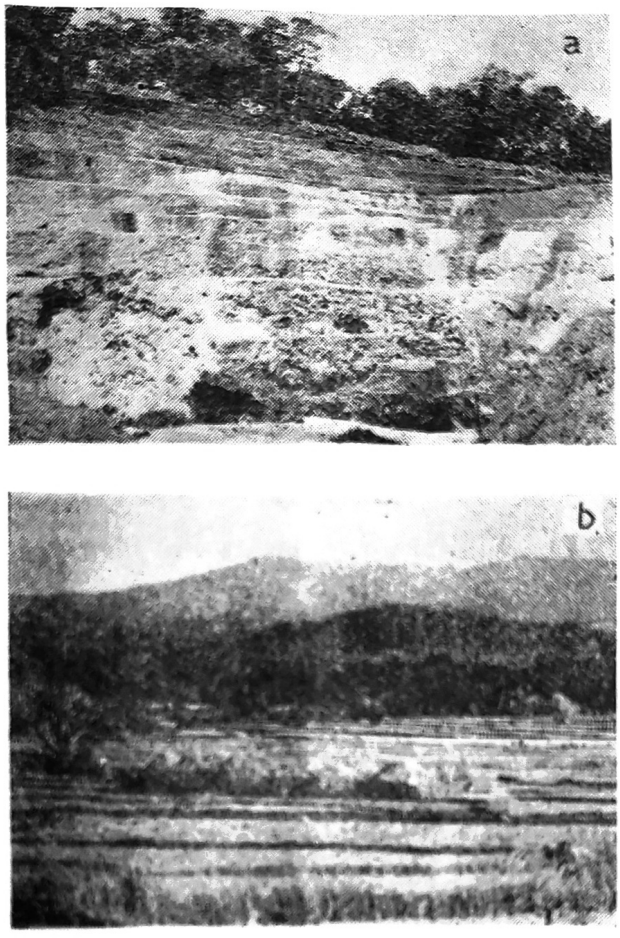

Plate 3. a. Degradation of forest for mining Jagalbet near Ganeshgudi (Supa). b. Deforestation due to encroachment for agriculture

of bamboo are seen due to the unscrupulous cutting for meeting the high and incessant demands of the West Coast Paper Mills at Dandeli. The varieties of climbers such as *Calamus rotang, Diplochisia glaucescens, Gnetum ula* etc are also found in evergreen forests of Ambikanagar and Ganeshgudi (Supa). The floor of the forest is covered by some of the grasses. Presently, in many places at Dandeli and other surrounding areas the ground vegetation is replaced by the aggressive and notorious weeds such as *Eupatorium, Lantana, Cassia* and other species. The above described Kanara forest areas support the fauna as depicted below.

Fauna: The North Kanara forest has its own faunal pattern and a variety of wildlife. This area is a paradise for the variety of insect community, Amphibians, lizards, snakes and crocodiles. The Kanara forest is also an abode for the big and small mammals (Kamath, 1986).

Avifauna: Though the forests of North Kanara are much disturbed and deforested for various purposes, they are still the abode for over 246 species of birds belonging to 54 families of 18 orders (Basalingappa *et al,* unpublished). More than 50% of the total bird species are insectivorous. The remaining bird fauna comprises frugivorous, nectarivorous, granivorous, carnivorous, omnivorous etc There are many threatened species like, Osprey, Peafowl, Great Pied Hornbills and Malabar Pied Hornbills need much protection.

Dandeli Wildlife Sanctuary: Karnataka Government has established the Dandeli Wildlife Sanctuary in the year 1956. Wildlife protection Act 1972 and 1973 has come

into force in Karnataka from 1973. With the enforcement of this act hunting has been totally prohibited in the game sanctuary, and almost all species are declared as preserved species.

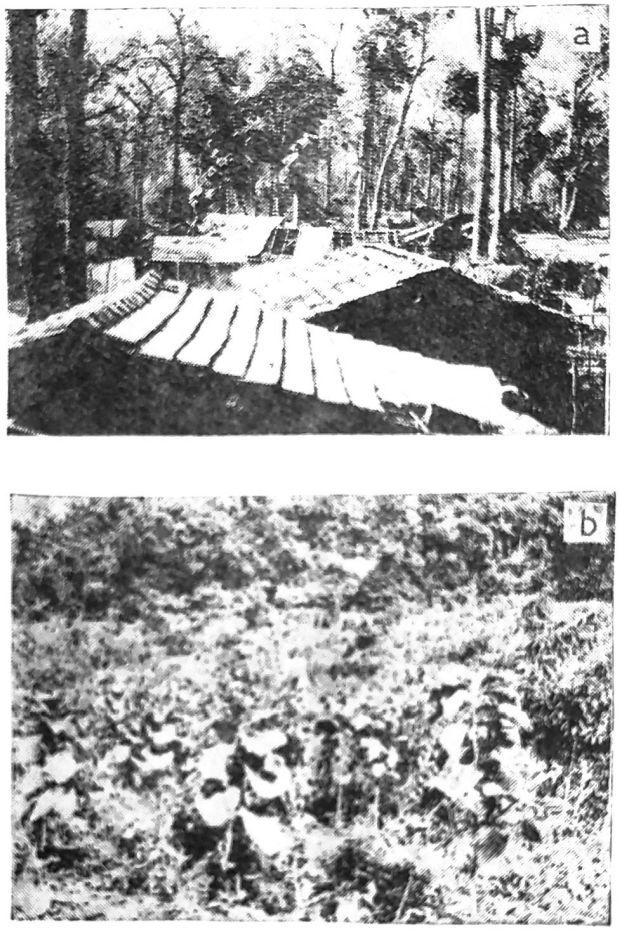

Plate 4. a. Encroachment of forest by the villagers at Dandeli. b. Reforested with monoculture of teak at deforested areas.

The Malabar Pied Hornbill *A. coronatus* according to Tikadar (1983) is a threatened bird. The present investigation envisages the study of the distribution and seasonal variation of these birds in the above described study areas. The study also envisages the survey and enumeration of food plants of hornbills.

Methods

Survey for the study of hornbills was conducted for 5 days i. e., from 9th to 13th of every month for a period of 13 months from December 1983 to December 1984. Each study area was visited once in every month for all the 13 months. Camps were made at Dandeli, Ganeshgudi (Supa) and Ambikanagar and covered other study areas such as Haliyal and Kulagi. Counting of hornbills was done normally in the morning hours between 0700 h and 1000 h. On some days the rains and heavy fog interrupted the observations. The size of the area at each site was a line transect of 6000 m long extending approximately 50 m on either side of the transect. Details regarding the number of hornbills recorded from different forest areas are illustrated in Table 1.

On two occasions visits were made to Ramanaguli forest situated at about 100 km from Dharwad on the way to Karwar and recorded some observations regarding the Malabar Pied Hornbills.

Table 1. Month-wise record of Malabar Pied Hornbills *Anthracoceros coronatus* per transect (6000 x 100 m) from different forest areas of North Kanara Forest of Western Ghats.

Month & Year	Number of Hornbills observed in different forest areas					Total number of birds from all the forest area
	Haliyal	Dandeli	Kulagi	Ambikanagar	Ganeshgudi	
December 1983	0	9	0	0	0	9
January 1984	0	4	0	0	2	6
February ,,	0	27	0	0	2	29
March ,,	0	58	0	16	0	74
April ,,	0	50	0	0	0	50
May ,,	4	38	4	0	2	48
June ,,	0	19	0	0	0	19
July ,,	0	6	0	0	3	9
August ,,	0	6	0	0	0	6
September ,,	0	4	0	0	2	6
October ,,	0	12	0	2	0	14
November ,,	0	22	0	0	2	24
December ,,	0	27	0	0	0	27
Average number of birds recorded	0.31	21.69	0.31	1.38	1.0	24.69
Percentage of birds	1.25	87.85	1.25	5.60	4.05	

Surveyed and enumerated the food plants of hornbills in each unit area (6000 x 100 m) in the above mentioned places. Examined the fruiting period of food plants from different study areas. The number of food plants in different study areas and their fruiting period are illustrated in Table 2.

Table 2. Number and percentage of different food plants of *Anthracoceros coronatus* per transect (6000 x 100 m) from different study areas. Fruiting season of different food plants also shown.

Food Plants	Number of food plants in different study areas					Fruiting season
	Haliyal	Dandeli	Kulagi	Ambikanagar	Ganeshgudi	
Ficus glomerata•	4	9	3	4	4	Throughout the year
F. religiosa	5	5	5	5	3	Oct-January
F. rumphi	2	1	0	1	8	Apr-July
F. bengalensis	4	5	6	3	3	Oct-March
F. infectoria	3	4	3	3	3	Jan-March
Caryota urens	0	1	0	2	0	Most of the year
Strychnos, nux-vomica	3	14	5	6	3	Nov-April
Machilus macrantha	0	2	0	2	1	Feb-April
Swietenia mahagoni	0	1	0	0	0	Mar-April
Grewia tiliifolia	7	11	6	4	16	Apr-July
Melia composita	3	5	3	3	3	Feb-May
Schleichera oleosa	4	7	4	4	14	June-August
Buchanania sp	1	2	1	0	1	Apr-May
Mallotus philippensis	1	9	3	3	13	Mar-April
Polyalthia fragrans	2	6	2	3	0	Apr-June
Total	39	82	41	43	62	
Percentage of birds	14.6	30.7	15.4	16.1	23.2	

• Different plants of the same species in the same area show fruiting in different months of the year.

Results

North Kanara forest as a whole is under heavy deforestation. In most places the deforested area is reforested with monoculture of mainly teak. The survey revealed that the Haliyal area is gradually changing to agricultural fields, the Ambikanagar forest and Ganeshgudi (Supa) have gone under the hydro-electric project as well as mining and staff colonies. When compared to other areas, Dandeli forest is less affected. One more dam has to come up at Dandeli and the work on clear felling of the trees is in progress.

During the survey, the hornbills *A. coronatus* were sighted at Haliyal, Dandeli, Kulagi, Ambikanagar and Ganeshgudi forests (Fig. 1). The number of hornbills in different study areas in different months of the year 1983-84 is depicted in Table 1. Average number and percentage of hornbills in Dandeli forest in 13 visits during 13 months from December 1983 to December 1984 was 21.69 (87.85%). Number and percentage of these birds in Ambikanagar and Ganeshgudi showed 1.30 (5.60%) and 1.0 (4.05%) respectively. In both the places Haliyal and Kulagi, only 0.31 (1.25%) birds could be observed. No nests of hornbills were recorded in the transects of any of the study areas, but the roosting place was situated near the transect at Dandeli study area.

Month-wise records from all the places revealed the highest number of 74 birds in the month of March 1984 followed by 50 and 48 in April and May 1984 respectively. Minimum number of 6 hornbills was found in the monts of January, August and September 1984. During the remaining months number of birds varied from 9 to 29. A single biggest flock comprising 58 hornbills was recorded in Dandeli forest in the month of March 1984.

Visits were also made to Ramanaguli forest on 22nd April and 9th Semptember 1985 and observed 22 and 8 hornbills respectively. Casual observations at Karnatak University Botanical Gardens during July-August 1984 and 1985 showed about 5 hornbills. They were never found in other months.

Hornbills were observed feeding on the fruits from different tree species. They are very fond of *Strychnos* and *Ficus* fruits. Number of different food plants on which *A. coronatus* mainly feed were counted along a line transect— 6000 x 100 m in different study areas and the percent number of food plants from all the areas together is given in Table 2. The highest number of 82 (30.7%) food plants were found in Dandeli followed by 62 (23.2%) plants in Ganeshgudi, 43 (16.1%) in Ambikanagar, 41 (15.4%) in Kulagi and 39 (14.6%) in Haliyal.

The fruiting season of different food plants of hornbills was observed. Fruiting of *Ficus glomerata* was regularly found throughout the year but not in synchrony. The same species of food plant in the same area showed the fruiting in different months of the year. Of the 15 different food plants, 11 plants were found fruiting in summer months forming 73%. Apart from *Ficus glomerata* in which fruiting occurred througout the year, the fruiting in *Strychnos nux-vomica* was found spread out for longer period from November to April.

Discussion

As the Malabar Pied Hornbills *Anthracoceros coronatus* are frugivorous birds (Jerdon, 1862; Baker, 1927; Ali and Ripley, 1983) their distribution is strongly governed by the availability of food source-food plants. Looking to the results, the number of hornbills depends upon the abundance of food plants. The variation in the number of hornbills from one area to another is also dependent on number of food plants. Presently Dandeli, Haliyal and Kulagi forests are mostly deciduous type. Regular occurrence of hornbills in deciduous forests of Dandeli, Haliyal Kulagi is in conformity with the records of Jerdon (1862), Davidson (1898), Baker (1927) and Lowther (1942) who held the view that these birds preferred tropical deciduous forest.

Survey revealed the highest number of 74 hornbills which comprised a single biggest flock of 58 birds observed at Dandeli in the month of March 1984. The earlier records about the number of hornbills from North Kanara forest was by Davidson (1898). At Bhutkal, he recorded a pair in January 1889, and a flock of some 20 birds near kutgul in January 1894. According to Ali and Ripley (1983), the probable breeding period is May-July. The reduction in number of hornbills during the early monsoon may be attributed to the confinement of females to the nest and attendance of males to the nest for feeding the females and nestlings.

These hornbills are very fond of the fruits of *Strychnos* (Jerdon, 1862) and *Ficus* (Ali and Ripley, 1983). Our observations fully tally with the records of the above authors. The number of hornbills in the summer months from February to May at Dandeli was very high (Table 1). About 73% of the food plants from all areas were found fruiting from November to April at Dandeli forest. Even the number of *Ficus* trees were more. The destruction of forest in Ganeshgudi (Supa), Ambikanagar and Haliyal resulted in the loss of natural habitat is one of the reasons for the presence of less number of hornbills. The occurrence of hornbills in high number at Dandeli forest area is due to good number of food plants and suitable roosting place.

Conservation Suggestions

As we know the clear felling of the trees in the North Kanara forest in the Western Ghats is a continuous process. The deforestation is due to the establishment of hydro-electric projects, high tension electric lines, approach roads, staff colonies, mining and the encroachment for the purpose of agriculture and rehabilitation. Presently, the proposed atomic power station at Kaiga and the naval base at Karwar destroy the bigger areas of forests. On one hand it is socio-economic development and on the other towards the destruction of natural environment. The destruction of the natural habitat strongly influencing every living organism in the eco system.

The most important aspect of the conservation of hornbills is the protection and maintenance of suitable habitat. From our study and the literature it is obvious that the hornbills prefer natural deciduous forest with good number of food plants. Monoculture of teak and eucalyptus is also one of the severe problems for the fruit eating birds. Banning the clear felling of the trees is of prime necessity to conserve the hornbills. Immediate steps should be taken not to cut the fruiting trees which form the food of hornbills in the selective logging areas. Aforestation of mixed plantation is suggested rather than the monoculture. It is also necessary to retain the tall trees with the holes in trunks for nesting these birds.

Poaching of hornbills is still continuing in this area. According to the tribal people of this area, the oil extracted from the body and the paste obtained from the bone of the hornbills is used for the cure of joint pains. The feathers and the beak are also used as charm by the tribals. Hence, strict vigil over the poachers by the officials of the Forest Department is quite necessary. We would like to emphasise that the creation of general awareness and education about the importance of Wildlife in general and the birds in particular to the people is desired to prevent illegal killing.

Acknowledgements

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